Reflections in the sand:
understanding bird die-offs from beach surveys in the Monterey Bay National Marine Sanctuary, 1997 – 2007

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Methods

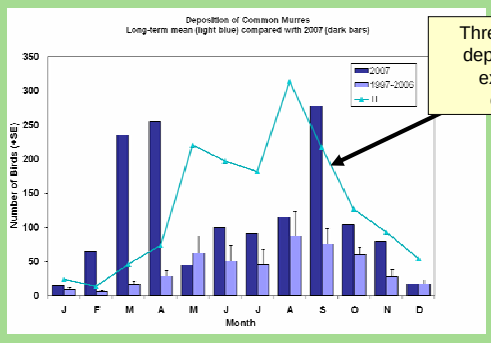
We use standardized survey methods to obtain baseline rates of seabird deposition (birds /km/mo.) along area beaches, and to identify unusual mortality events.

Methods include:
- Volunteers are trained to identify marine birds and mammals
- Two observers per beach
- Same survey segments each month (1-3 km, see map left)
- Standard Datasheets
- Mark birds to avoid double-counting

Introduction

We reflect on a decade of beach survey data conducted by the Coastal Ocean Marine Bird and Mammal Education and Research Surveys (BeachCOMBERS) to monitor monthly changes in beached birds and mammals in the Monterey Bay National Marine Sanctuary. This program is dependent upon trained volunteers who serve as "citizen scientists" collecting valuable information in a standard effort to provide important information about the incidence of factors affecting marine birds and mammals in the sanctuary.

How do we know when a die-off is significant?



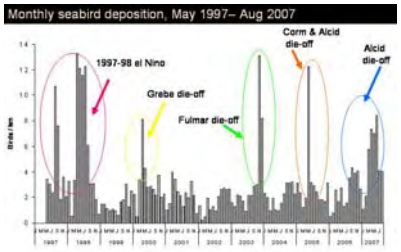
Threshold Level (TL) – When deposition for a given month exceeds TL, the event is considered "unusual".

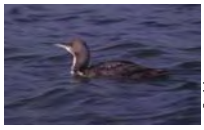
Common Murre – an abundant diving, fish-eating seabird

To determine if an increased number of dead birds in an area is really a major event or not, we use our past data to determine the long-term average and standard deviation, from these we calculate the **threshold level** (line). For example, the long-term mean deposition of Common Murres (graph below is generally greater in the summer than the winter – light blue bars). If deposition is greater than the threshold level for a given species, we can say is unusually increased relative to the norm for that time of year.

Results

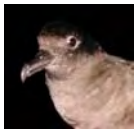
Since 1997, we have documented 15 unusual stranding events as evidenced by monthly carcass deposition exceeding the "Threshold level" (see right panel). We have also identified and additional 8 events which were determined by >2% of birds recorded as oiled and attributed to oil spills of unknown source.
Another four additional mortality events were documented by unusual location, spatial distribution, or number of rare avian species along Monterey Bay area beaches (e.g. 2006 Red Phalarope event & 2007 Puffin invasion).





J. Harvey

Pacific Loon – an migratory seabird which winters in Monterey and nests inland around lakes



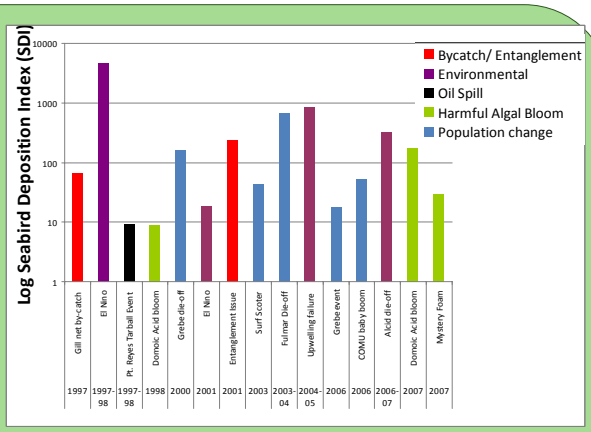
J. Adams

Sooty Shearwater – an migratory seabird which summers in Monterey and winters in the southern hemisphere

Trends?

Causes of the 15 major bird die-offs were attributed to a variety of sources (graph right), including:
environmental phenomena (n = 4) such as starvation due to el Niño or upwelling failure
- harmful algal blooms (n = 3)
- population fluctuations (n = 5) such as increased young produced or adults in area
- human activities such as fishery bycatch or entanglement (n = 2)
- oil spills (n =1)

Using this approach, we provide a relative measure of the relative frequency and severity of bird die-offs in the Sanctuary in the past and provide a framework to evaluate trends in cause of future mortality events.



To quantitatively compare events, we estimated the cumulative impacts by summing the percent exceeding TL for all species affected in an event and called this the Seabird Deposition Index (SDI).

Thanks…to all our BeachCOMBERS volunteers!

Interested in becoming a volunteer? Contact: Jean Jean.deMarignac@noaa.gov